Vehicle Crash Damage and Design Technology

Advanced computer codes and facilities are predicting vehicle crash damage and designing safer, lighter cars

Our experience in finite-element computer code development and impact testing and analysis enables us to analyze vehicle/barrier crash damage, and in turn design vehicles that can better protect occupants during an impact. Lawrence Livermore's team of analysts and developers, experienced in applying and modifying various computer codes, together with our extensive test facilities and design expertise, enable us to offer a complete technology resource to industry for vehicle crash damage assessments. We also can provide design and materials R&D to maximize occupant safety as well as reduce vehicle weight.

Crash computer codes

DYNA3D is a dynamic analysis computer code (with a time frame of milliseconds) that is used extensively in studying materials under large deformations. NIKE3D, while similar, is an implicit code allowing solution of longer term problems (time frame of seconds to years). It is used for studying impacts of vehicles with roadside structures.

NIKE3D and DYNA3D can be used separately or coupled to analyze the vehicle/barrier crash interaction. The ability to analyze crash and post-crash motion or handling with tools like NIKE and DYNA and an integrated vehicle dynamics capacity, enables us to provide greatly improved vehicle safety assessments over simpler, semi-empirical approaches.

### Design and analysis of conventional vehicles

APPLICATIONS
• Vehicle/barrier crash studies
• Electric vehicle safety
• Lightweight materials design

Our technology has been used in collaboration with the Federal Highway Administration (FHA), National Highway Traffic Safety Administration, university, and industrial partners to develop working models of subcompact, compact, and full-size cars. These models range in size from 2,000 to more than 20,000 finite elements. Our computer crash assessments show good agreement with vehicle tests. To assess either
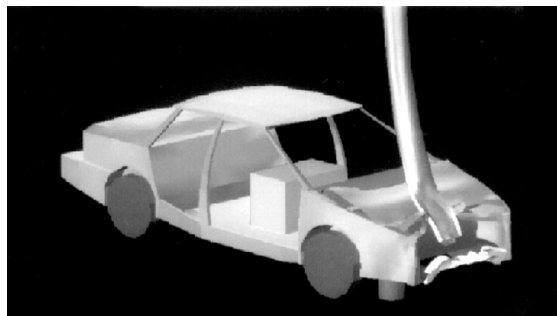
DYNA3D depiction of crash damage to domestic sedan and light pole.
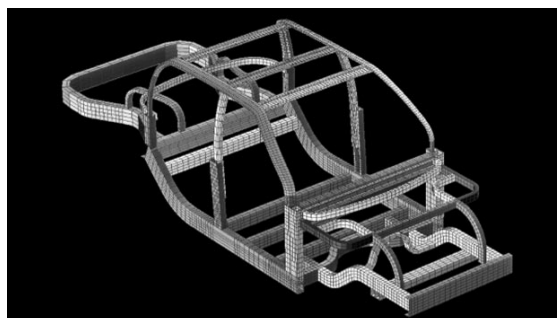
Crashworthy aluminum frame for an electric vehicle.

occupant injury or damage to an important payload, we have linked DYNA to crash-victim simulation codes.

Improving safety of electric vehicles

We are working with Kaiser Aluminum to improve electric vehicles by reducing their weight without sacrificing passenger safety. We also are working with the CALSTART Running Chassis Program to design and analyze a crashworthy aluminum frame that will protect occupants in eight vehicles.

Availability: Our crash assessment and vehicle design technology resources are available now, with both public and protected versions of our computer codes. Research and codes are tailored to meet requirements of collaborators.

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